

**REMARKS**

Upon entry of this amendment, claims 1, 11-12 and newly submitted claims 13-15 are pending in the application. Claim 1 is an independent claim drawn to an apparatus for processing heavy hydrocarbon feed, and the newly submitted claims depend therefrom. Newly submitted claim 13 is a method claim equivalent to the apparatus of claim 1. Claims 1 and 11 have been amended to further clarify what the Applicant considers to be the invention and to clarify the distinctions between the inventive subject matter and the prior art references. Claim 12 has been amended to correct the dependency thereof. Applicant further submits that the amendments to the claims do not add new matter within the meaning of 35 U.S.C. §132. The amendments to the claims have been made in order to advance prosecution of the application.

Claims 11 and 12 stand objected to for informalities found in the claims. Claim 1 stands rejected as being obvious over van Dongen et al. (U.S. Patent No. 4,405,441) in view of van Klinken et al. (U.S. Patent No. 4,039,429) and Kwant et al. (U.S. Patent No. 4,200,519). Claim 11 stands rejected as being obvious over van Dongen et al. (U.S. Patent No. 4,405,441) in view of van Klinken et al. (U.S. Patent No. 4,039,429) and Kwant et al. (U.S. Patent No. 4,200,519), and in further view of Frayer et al. (U.S. Patent No.

3,254,020). Applicant submits that the amendments to claim 1 and the following remarks place the application in condition for allowance.

**1. Objection to Claims 11 and 12**

Claims 11 and 12 are objected to as containing informalities for the reasons set forth in the Office Action.

Applicant has amended claims 11 and 12 to better clarify the subject matter of the claimed invention. Applicant respectfully submits that the amendments to claims 11 and 12 obviate this objection, and respectfully requests reconsideration and withdrawal thereof. Applicant submits that claims 11 and 12 are now definite in their scope.

**2. Rejection of Claims 1 and 11 Under 35 U.S.C. 103(a)**

Claim 1 stands rejected under 35 U.S.C. 103(a) as being obvious over van Dongen et al. (U.S. Patent No. 4,405,441) in view of van Klinken et al. (U.S. Patent No. 4,039,429) and Kwant et al. (U.S. Patent No. 4,200,519) for the reasons set forth in the Office Action.

Further, claim 11 stands rejected as being obvious over van Dongen et al. (U.S. Patent No. 4,405,441) in view of van Klinken et

al. (U.S. Patent No. 4,039,429) and Kwant et al. (U.S. Patent No. 4,200,519), and in further view of Frayer et al. (U.S. Patent No. 3,254,020) for the reasons set forth by the Examiner in the Office Action.

### **RESPONSE**

Applicant respectfully traverses this rejection and requests reconsideration and withdrawal thereof.

The references of record, van Dongen et al., van Klinken et al. and Kwant et al., as well as Frayer et al., do not teach or suggest applicants' inventive subject matter as a whole, as recited in the amended claims. Further, there is no teaching or suggestion in the references which would lead the ordinary skilled artisan to modify them to derive the subject matter as defined in the amended claims.

The U.S. Supreme Court in *Graham v. John Deere Co.*, 148 U.S.P.Q. 459 (1966) held that non-obviousness was determined under § 103 by (1) determining the scope and content of the prior art; (2) ascertaining the differences between the prior art and the claims at issue; (3) resolving the level of ordinary skill in the art; and, (4) inquiring as to any objective evidence of nonobviousness.

To establish a *prima facie* case of obviousness, the Examiner

must establish: (1) that some suggestion or motivation to modify the references exists; (2) a reasonable expectation of success; and (3) that the prior art references teach or suggest all the claim limitations. Amgen, Inc. v. Chugai Pharm. Co., 18 USPQ2d 1016, 1023 (Fed. Cir. 1991); In re Fine, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988); In re Wilson, 165 USPQ 494, 496 (C.C.P.A. 1970).

A *prima facie* case of obviousness must also include a showing of the reasons why it would be obvious to modify the references to produce the present invention. See Ex parte Clapp, 277 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). The Examiner bears the initial burden to provide some convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings. Id. at 974.

#### **A. The Present Inventive Subject Matter**

As amended above, independent claim 1 is drawn to an apparatus for processing heavy hydrocarbon feed. The apparatus **consists essentially of** a heater for heating the heavy hydrocarbon feed, an atmospheric fractionating tower for fractionating the heated heavy hydrocarbon feed fed to the inlet of the atmospheric fractionating tower, thereby producing light atmospheric fractions and atmospheric bottoms, and a further heater for heating the

atmospheric bottoms and producing heated atmospheric bottoms. The apparatus also includes a vacuum fractionating tower for fractionating the heated atmospheric bottoms and producing light vacuum fractions and vacuum residue, and a solvent deasphalting (SDA) unit for producing deasphalted oil (DAO) and asphaltenes from the vacuum residue. The apparatus further includes a deasphalted oil thermal cracker for thermally cracking the deasphalted oil (DAO) and producing thermally cracked deasphalted oil, and a thermally cracked deasphalted oil connector connecting an outlet of the deasphalted oil thermal cracker to an inlet of the first fractionating tower by way of a line so that only the thermally cracked deasphalted oil is recycled to the inlet of the atmospheric fractionating tower by way of the line. The apparatus still further includes a light vacuum fraction thermal cracker for thermally cracking the light vacuum fractions for producing thermally cracked light vacuum fractions, a thermally cracked light vacuum fractions connector connecting an outlet of the light vacuum fraction thermal cracker to an inlet of the first fractionating tower by way of a line so that only the thermally cracked light vacuum fractions is recycled to the inlet of the atmospheric fractionating tower by way of the line. The first fractionating tower is the atmospheric fractionating tower.

Claim 11 depends from claim 1 and adds further limitations thereto. Thus, claim 11 contains all of the limitations found in claim 1, and since claim 1 is not obvious over the combination of references, then claim 11 is not obvious for the same reasons.

### **B. The Prior Art**

To reiterate that which has been previously stated in a prior response, Van Dongen (U.S. Patent No. 4,405,441) discloses a process for the preparation of hydrocarbon oil distillates. The distillates are prepared from asphaltene-rich feeds by a process comprising subjecting the feed to catalytic hydroconversion, and subjecting the distillation residue of the hydroconverted product to a combination of solvent deasphalting and thermal cracking.

In addition, van Klinken (U.S. Patent No. 4,039,429) discloses a combination of processes that are designed to convert atmospheric reduced crude to light products through conversion by Fluid Catalytic Cracking (FCC). Van Klinken discloses several combinations of vacuum distillation, visbreaking, deasphalting and FCC to obtain light products.

Further, Kwant et al. (U.S. Patent No. 4,200,519) discloses a process for the preparation of gas oil from residual oils by combination of two stages of thermal cracking, cyclone separation,

vacuum distillation, deasphalting, atmospheric distillation, and recycling of certain streams.

Frayner et al. (U.S. Patent No. 3,254,020) discloses the preparation of a high-boiling hydrocarbon mixture having a satisfactory sulfur content and a low pour point and also to improved procedure for preparing residual fuels.

**C. Differences between the Claimed Subject Matter**  
**and the Prior Art**

The differences between applicant's inventive subject matter and the cited reference are readily apparent from their independent and distinct disclosures.

As an initial matter, Applicant submits that claim 1 is already restrictive in its language. The claim recites that **only** the thermally cracked light vacuum fractions and **only** the thermally cracked deasphalted oil are recycled to the inlet of the atmospheric fractionating tower by way of the line(s). By using this language, the claim is restrictive in the structure of the apparatus. However, Applicant has amended claim 1 to recite the more restrictive transitional phrase of "consisting essentially of." It is well-known in U.S. patent law that the use of the

transitional phrase "consisting essentially of" limits the scope of a claim to the specified materials or steps and those that do not materially affect the basic and novel characteristics of the claimed invention. By amending the claims to use this transitional phrase, Applicant is further limiting the scope of the present inventive subject matter.

In addition, Applicant respectfully submits that van Dongen et al. and Kwant et al. have disparate teachings. As is indicated by the Examiner, the recycle in van Dongen et al. first passes through a number of additional apparatus components (additional atmospheric distillation unit, vacuum distillation unit, etc.) prior to returning to the atmospheric distillation unit. Kwant et al., does not include nearly the components of the van Dongen et al. disclosure. Applicant submits that one of ordinary skill in the art would not think to combine the references due to the great disparity in the process steps and apparatus components required to carry out those steps.

Further, as is claimed in amended claim 1, the present inventive subject matter is directed to an apparatus that **consists essentially of a deasphalted oil thermal cracker, a light vacuum fractions thermal cracker, and recycle of the thermally cracked deasphalted oil and the thermally cracked light vacuum fractions.**



The thermal cracking occurs with the **deasphalted oil and the light vacuum fractions**, thus resulting in the **absence of asphaltenes in the thermal crackers**. By this arrangement of the presently claimed apparatus, substantially all of the asphaltenes, both in the original feed and that which is produced by the thermal processes, is rejected in the asphaltene stream, **which is not fed to either thermal cracker**.

Thus, the presently claimed inventive subject matter removes essentially all of the asphaltenes before thermal cracking, thereby removing the danger of coking by both of the thermal crackers feed streams. This advantage is further enhanced by the fact that the feeds entering both thermal crackers are first subjected to atmospheric fractionation in the first atmospheric fractionating tower, **as well as** solvent deasphalting prior to being thermally cracked. The solvent deasphalting step removes the asphaltenes from the feed, leaving only the deasphalted oil, which is fed to the thermal cracker. This also allows for the complete use of the deasphalted oil. Likewise, only the light vacuum fractions are fed to the other thermal cracker.

Furthermore, by applying a hydrogen donor stream or hydrotreated further portion of the further light vacuum stream to both the deasphalted oil thermal cracker and the light vacuum

fractions thermal cracker, thermal cracking takes place in the presence of the hydrogen donor stream. The presence of the hydrogen donor stream aids in providing a higher quality and cleaner cracked product. Applicant submits that this is not shown in any of the cited references.

van Dongen et al. teach that only **some** of the cracked material is recycled. As is clearly seen in the van Dongen patent, the patent teaches **thermal cracking asphaltenes**. In particular, asphaltenes are present in feed stream 313 of Fig. 3, 404 of Fig. 4 and 530 of Fig. 5. These streams all lead to the thermal cracker in the respective apparatus depicted by the figure in question. As is stated above, the present claims are directed to an apparatus in which **no** asphaltenes are fed to either thermal cracker. Thus, the presently claimed apparatus is clearly different from the apparatus in the van Dongen et al. patent.

Furthermore, the van Klinken et al. patent and van Dongen et al. patent also teach the cracking of asphaltenes. It can be clearly seen in van Klinken that the asphaltene containing residue of high pressure hydrotreating and distillation or deasphalting are subjected to cracking (see col. 3, lines 5-9 as well as the figures showing the bottoms of deasphalting unit 4 being fed to thermal cracker 5). Additionally, van Klinken et al. do not teach

recycling the thermally cracked product to the atmospheric distillations column. Thus, as with the van Dongen et al. patent, the presently claimed apparatus is clearly different from the apparatus disclosed in the patent.

Likewise in the Kwant et al. patent, **"an asphaltenes-containing hydrocarbon oil residue (7) obtained by atmospheric distillation is thermally cracked in zone (1)."** Col. 4, ll. 7-8. This is also readily apparent from the figure in the patent. In addition and as with the van Klinken et al. patent, Kwant et al. fail to disclose recycling the thermally cracked product to the atmospheric distillation column. Again, this is different from the present claims, which explicitly exclude asphaltenes from the thermal crackers.

Since none of the references suggest or teach the above limitations, Applicant respectfully submits that the combination thereof would also be deficient with respect to those limitations. Assuming, *arguendo*, that the references were combined in an attempt to achieve the presently claimed subject matter, Applicant respectfully submits that such a combination would still teach the thermal cracking of asphaltenes, which is contradictory to the claimed invention. Thus, the combination would fail to teach all claimed limitations, as is required in order to prove a *prima facie*

case of obviousness. In particular, the combination of references would still lack the above limitation of thermally cracking asphaltene-free streams which, as explained above, is an important aspect of the present inventive subject matter.

Turning now to claim 11, claim 11 adds the further limitation of the apparatus of claim 1 including means for supplying only the heavy portion of the light vacuum fractions to the light vacuum fraction thermal cracker. However, Applicant respectfully submits that van Dongen et al., van Klinken et al., and Kwant et al. do not render obvious the limitations of claim 1, for the reasons set forth above. Therefore, the references fail to render obvious claim 11 for the same reasons. The Examiner, however, argues that Frayer et al. teach the additional limitation as claimed in claim 11.

Applicant respectfully submits that Frayer et al. fails to cure the deficiencies of the three previously cited references with respect to claim 1. In other words, Frayer et al. do not supply the limitations of claim 1 that are missing from the combination of the references. In particular, Frayer et al. do not teach the removal of asphaltenes prior to thermal cracking. Thus, the combination of references would still teach the thermal cracking of asphaltenes, in contradiction to the present claims. For this

reason, the combination of references fails to render claims 1 and 11 obvious.

Furthermore, Applicant respectfully submits that the Examiner is using hindsight in attempting to fashion a combination of references to render claim 11 as obvious. The Examiner is using the present application as a template in order to pick and choose references in an attempt to render obvious claim 11. One of ordinary skill in the art at the time of the invention would have no motivation whatsoever to combine these four references in an attempt to achieve the subject matter of claim 11.

Thus, Applicant respectfully submits that the Examiner has failed to prove a *prima facie* case of obviousness since the combination of references would fail to teach every claimed limitation. As such, Applicant respectfully submits that the claims are not obvious over the references, and respectfully requests reconsideration and withdrawal of the rejection.

### **3. Newly Submitted Claims 13-15**

As is stated above, newly submitted claims 13-15 are the method equivalent of the apparatus claims under consideration. As such, Applicant respectfully submits that newly submitted claims 13-15 are not obvious over the prior art of record for the reasons

set forth above.

**CONCLUSION**

In view of the foregoing, applicants respectfully request the Examiner to reconsider and withdraw the all pending rejections, and to allow all of the claims pending in this application.

If the Examiner has any questions or comments regarding this matter, he is welcomed to contact the undersigned attorney at the below-listed number and address.

Respectfully submitted,

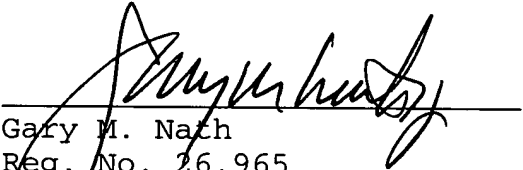
**NATH & ASSOCIATES**

Date: \_\_\_\_\_

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**NATH & ASSOCIATES**

1030 Fifteenth Street, N.W.  
Sixth Floor  
Washington, D.C. 20005  
Tel: (202) 775-8383  
Fax: (202) 775-8396  
GMN:JLM:sv/rfr2.wpd

  
\_\_\_\_\_  
Gary M. Nath  
Reg. No. 26,965  
Jerald L. Meyer  
Reg. No. 41,194  
Customer No. 20529